



# **At the End of the Pipe: Issues & Impacts Associated With Manchester's Urban Ponds**

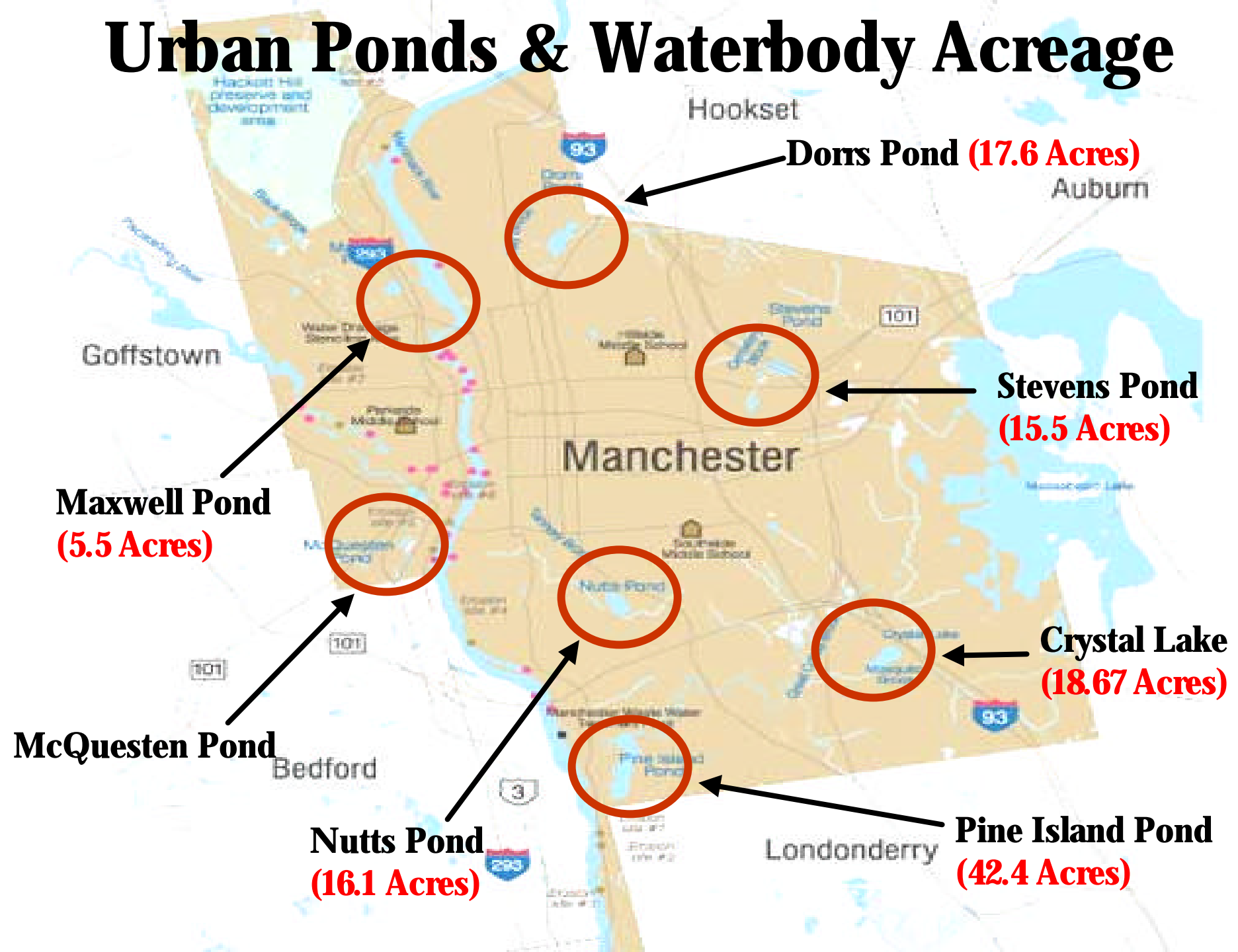
**NEC NALMS Annual Meeting  
Saturday June 4, 2005**

**Jen Drociak  
Manchester Conservation Commission  
Urban Ponds Restoration Program**

# **Overview**

- 1. Common Issues Facing Manchester's Ponds**
- 2. Manchester Urban Pond Restoration Program**
- 3. Data Collection, Goal Setting & Project Prioritization/Planning**
- 4. Case Studies: Solutions & Project Implementation**
- 5. Outreach/Education Endeavors**

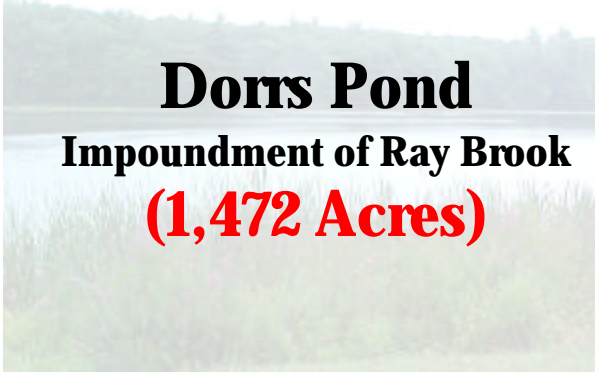
# Urban Ponds & Waterbody Acreage



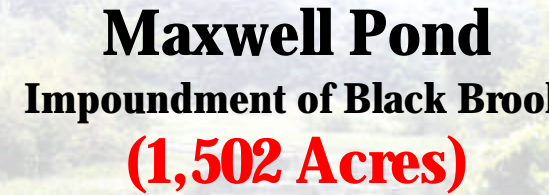
# Urban Ponds & Watershed Acreage



**Crystal Lake**  
**(200 Acres)**



**Dorris Pond**  
**Impoundment of Ray Brook**  
**(1,472 Acres)**



**Maxwell Pond**  
**Impoundment of Black Brook**  
**(1,502 Acres)**



**McQuesten Pond**



**Nutts Pond**  
**(415 Acres)**



**Pine Island Pond**  
**Impoundment of Cohas Brook**  
**(7,239 Acres)**



**Stevens Pond**  
**(444 Acres)**



# **1. Common Issues Facing Manchester's Ponds**

## **2. Manchester Urban Pond Restoration Program**

## **3. Data Collection, Goal Setting & Project Prioritization/Planning**

## **4. Case Studies: Solutions & Project Implementation**

## **5. Outreach/Education Endeavors**



# Degraded Water Quality

- ❖ **Nutrient loading**
- ❖ **Increased algal blooms**
- ❖ **Decreased dissolved oxygen levels**
- ❖ **Heavy metals loading**
- ❖ **High bacteria counts & septic systems**



# **Stormwater & Sediment Runoff from Culverts & Tributaries**

## **(NPS Pollution)**

- **Rain, snow runs over land, picks up pollutants, deposits them into waterbodies.**

- **Includes oil and sand from roadways, sediments from construction sites, eroding streambanks, nutrients, toxic materials from urban and suburban areas.**

**\* High-intensity flash storm surges \***

- **Ray Brook → Dorrs Pond**
- **Tannery Brook → Nutts Pond**
- **Cemetery Brook → Stevens Pond**





# Eroded Shorelines & Inadequate Vegetative Buffers

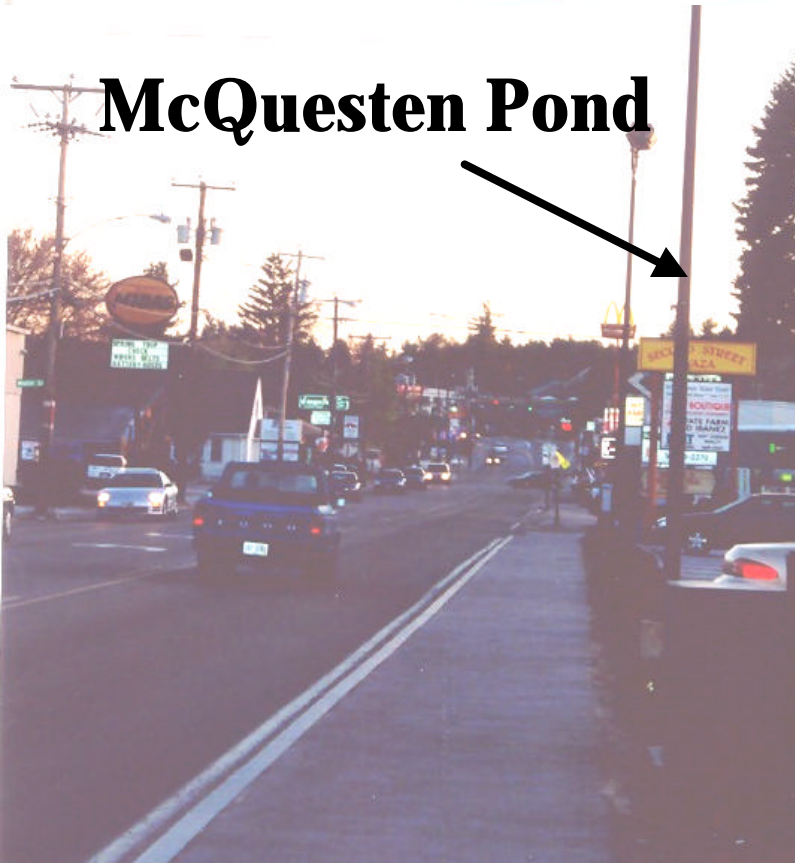
- Intensely-maintained shorelines.
- Inadequate vegetation on shorelines.
- Armored banks.

**Erosion causes increased sediment, phosphorus loading, smothers bottom habitat, and decreases water clarity**



# Commercial Zones: Second Street & So. Willow Street

**McQuesten Pond**



**Nutts Pond**





# Transient Residents

- **Difficult generating public support and participation at Maxwell Pond and Nutts Pond since most of the abutters are apartment-dwellers and do not live in the area long-term.**



**\*Crystal Lake, Dorrs Pond, & Pine Island Pond surrounded by home and camp owners. Crystal Lake and Dorrs Pond both have active and successful pond preservation societies\***

# I93 Highway Runoff

- **Stevens Pond:**  
Receives untreated runoff from I93.
- Some of the highest **chloride** and **sodium** levels for a freshwater body in the state of NH!



Don't forget the **sand, oil, grit** and other vehicular “drippings” that find themselves in the water!



# Dumpsters, Trash, Illegal Dumping

**McQuesten Pond**



**Nutts Pond**





# Graffiti



# Invasive Plant Species: Terrestrial

**Japanese  
Knotweed**



**Autumn Olive**

**European  
Buckthorn**





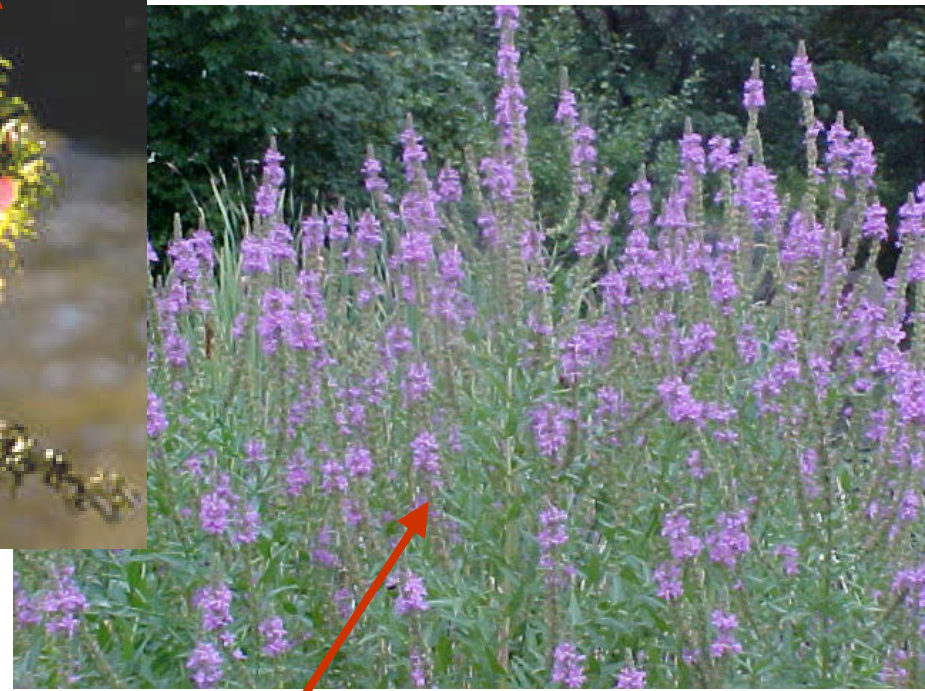
# Aquatic Invasive Species



**Common Reed  
(*Phragmites*)**



**Brazilian elodea**



**Purple Loosestrife**

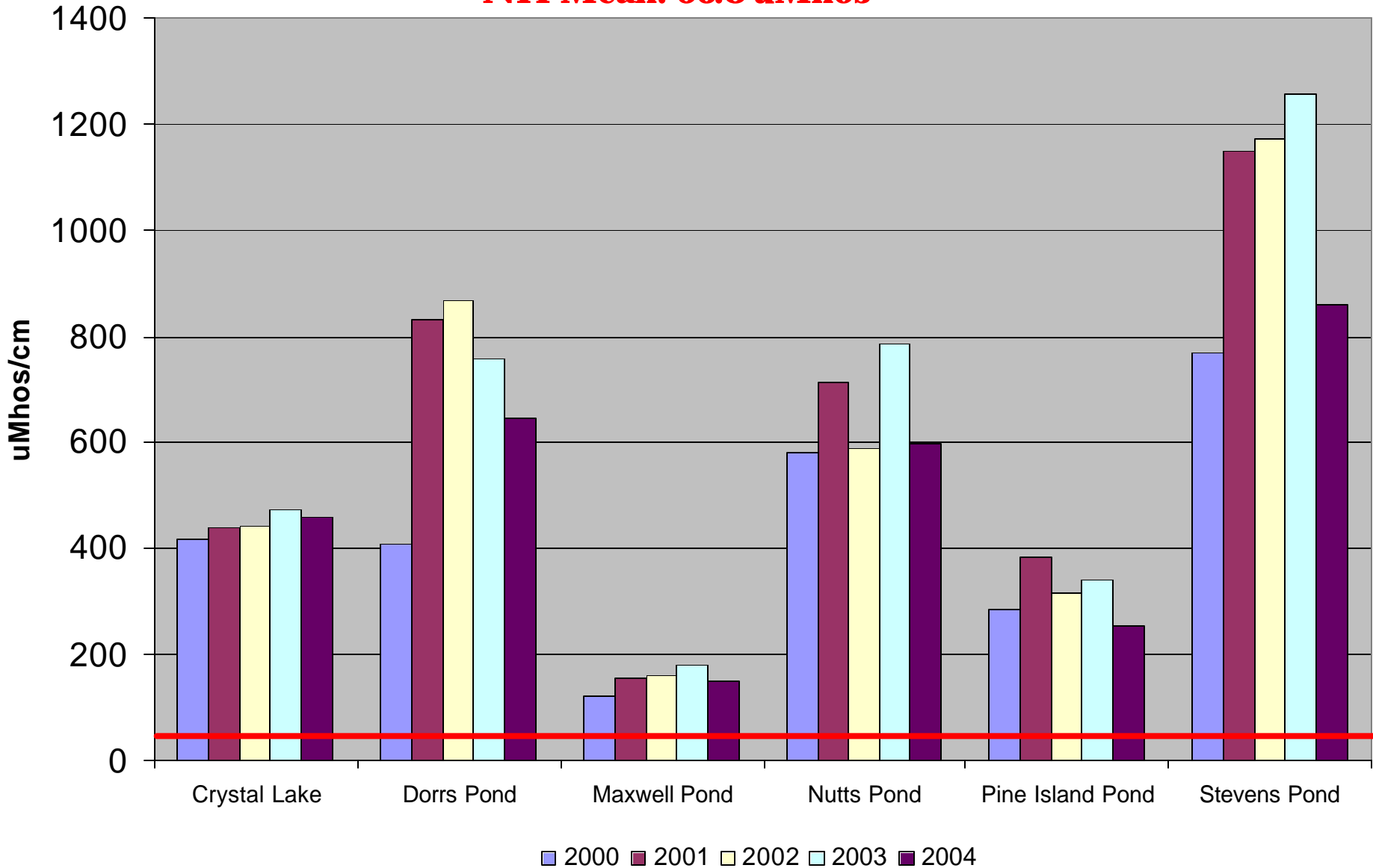


# **Purple Loosestrife – An Ambitious Invader!**



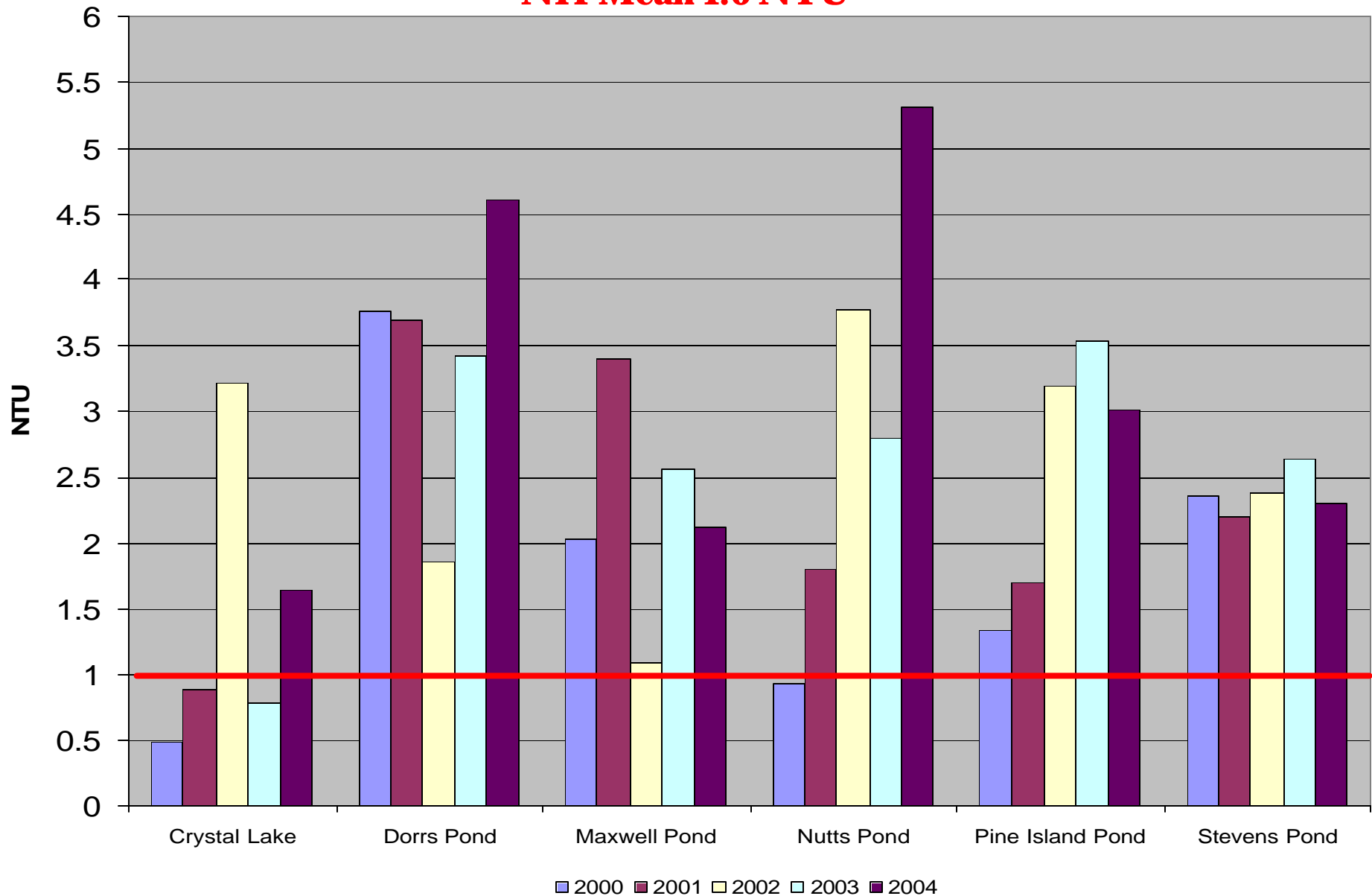
# Conductivity (2000-2004)

**NH Mean: 56.8 uMhos**



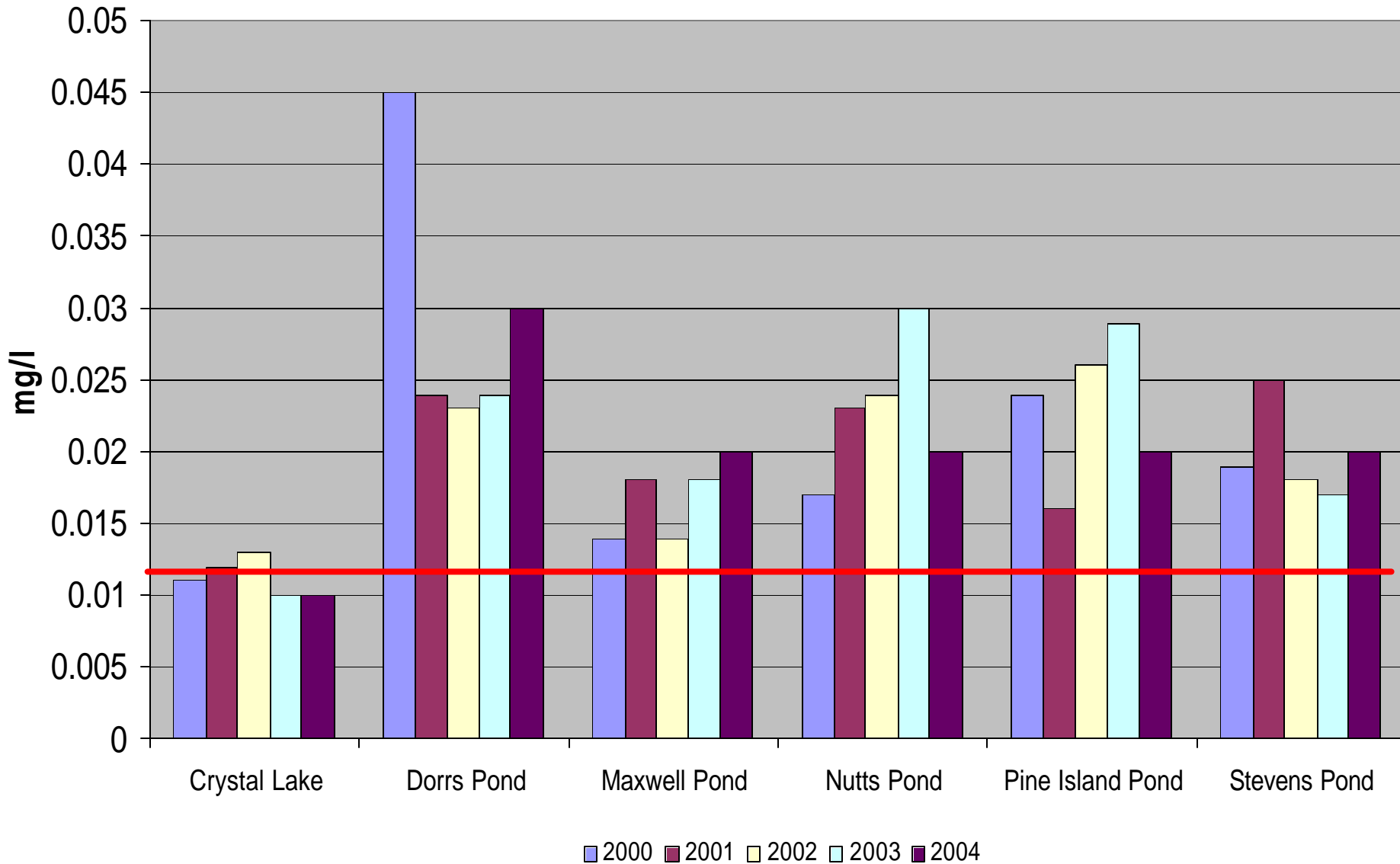
# Turbidity (2000-2004)

**NH Mean 1.0 NTU**



# Total Phosphorus (Epilimnion) 2000-2004

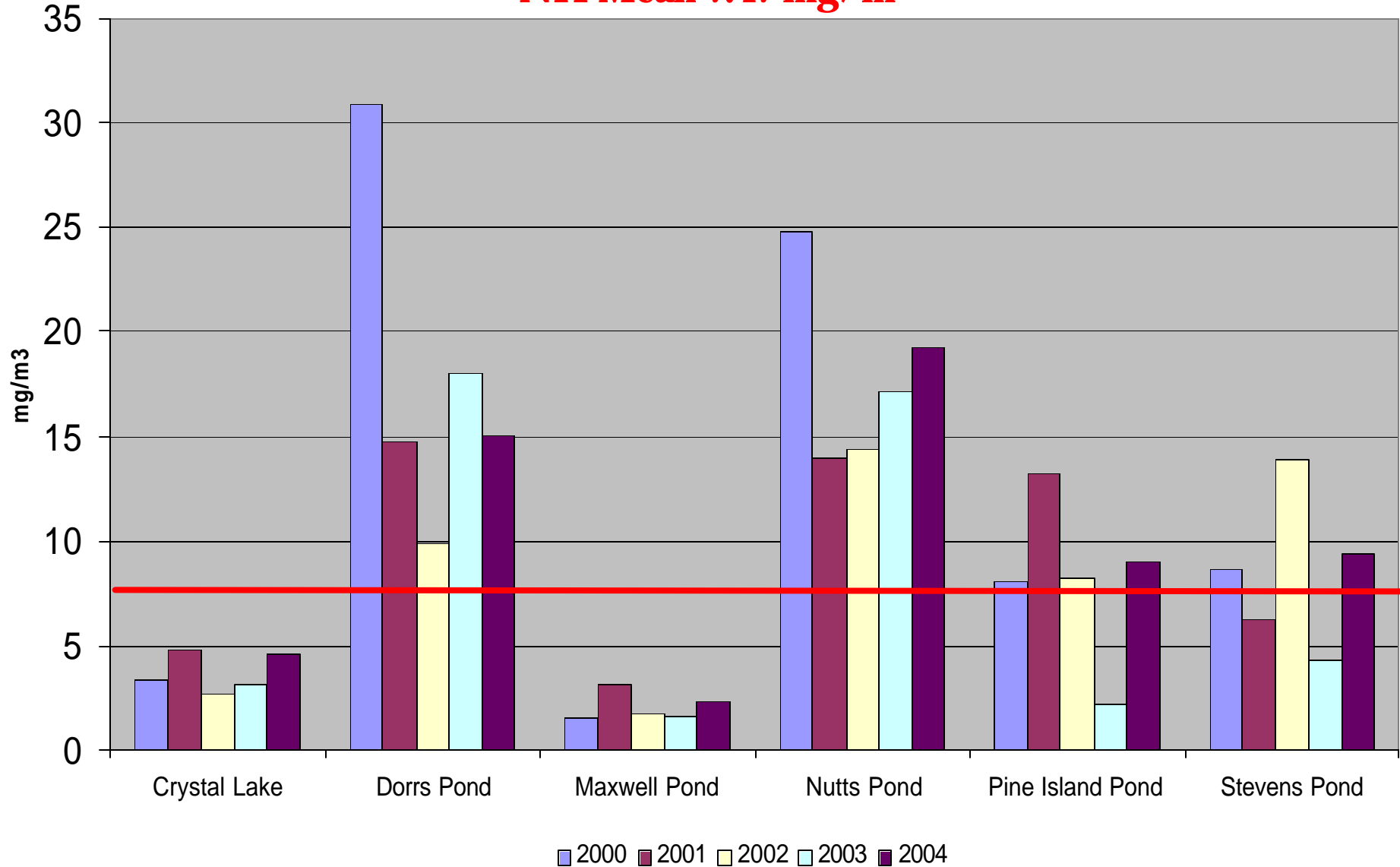
**NH Median .011**





# Chlorophyll-a (2000-2004)

**NH Mean 7.47 mg/m<sup>3</sup>**

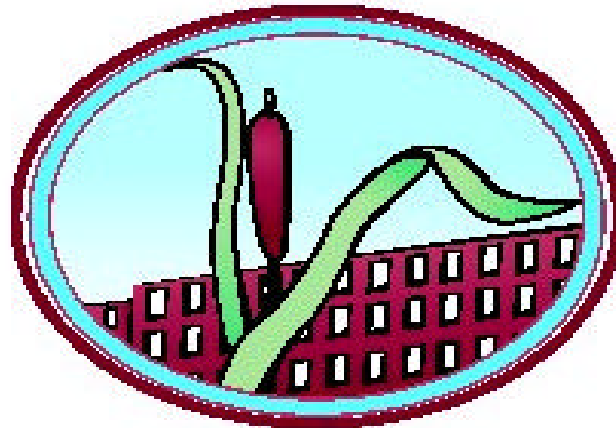


## **2. Manchester Urban Pond Restoration Program**

**3. Data Collection, Goal Setting & Project Prioritization/Planning**

**4. Case Studies: Solutions & Project Implementation**

**5. Outreach/Education Endeavors**



**“Improving the health of Manchester’s ponds with the power of partnership and the spirit of community”**

# **What Is The Manchester Urban Ponds Restoration Program?**

- ❖ **Part of the Supplemental Environmental Projects Plan (SEPP)**
- ❖ **Agreement between the city of Manchester, NHDES & USEPA correct the combined sewer/stormwater overflow problem.**
- ❖ **One of several environmental projects.**
- ❖ **7 ponds in Manchester have been evaluated and monitored for restoration potential.**

# What is the Goal of the Program?

**Goal:** Return the ponds to their historical uses

## **Objectives:**

- 1. Promote public awareness, education, and stewardship.**
- 2. Reduce pollutant load/nutrient inputs to improve water quality.**
- 3. Maintain or enhance biological diversity.**
- 4. Provide better recreational uses.**



### **3. Data Collection, Goal Setting & Project Prioritization/Planning**

**4. Case Studies: Solutions & Project Implementation**

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# How Do We Proceed?!

- **7 Ponds**
- **4 Inlets, 7 Outlets**
- **Other unnamed/seasonal tributaries/stormwater runoff**
- **1 Staff Person (Planning Department)**
- **5 Years (2000-2005)**
- **\$1 Million**



# **1<sup>st</sup> Year (2000)**

## **Point & Nonpoint Source Shoreline Surveys**

- ❖ **Delineated and walked boundaries of watershed, inlets, and tributaries.**
- ❖ **Mapped point & NPS “hotspots”**





# **Yearly: Biological & Water Quality (NHDES VLAP) Monitoring**

**What Are The Water  
Quality Conditions?**

**Are There Any  
Noticeable Trends?**

- **Chlorophyll-a**
- **Conductivity**
- **Dissolved Oxygen & Temperature Profile**
- **Nitrogen**
- **Total Phosphorus**
- **Phytoplankton/Zooplankton**
- **Turbidity**

20. 4. 2000

# **2<sup>nd</sup> Year (2001)**

## **Shoreline & In-Lake Vegetation Surveys**

**What Vegetative Communities  
Are Present?**



**Are There Any Invasive  
Species?**



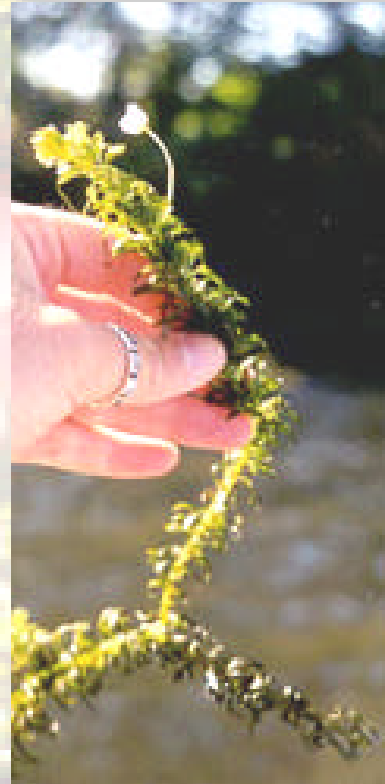
# **Found: Brazilian Elodea! (2001)**

## **The Bad News:**

- **Non-native, exotic aquatic plant!**
- **Not documented in NH prior to this finding!**
- **First documentation in New England!**
- **Potential to be worse than variable milfoil!**

## **The Good News:**

- **Pond not heavily used by motor-boaters**
- **Herbicide application: 2002**
- **Benthic-barriers: 2003**
- **Gone/2 small strands: 2004!**



# **3rd Year (2002)**

## **Fish Surveys & Tissue Analysis**



**Are The Fish Safe To Eat?**  
**(Mercury Content & Toxics)**

## **3rd Year (2002)**

### **Sediment Sampling & Analysis**



# All Ponds: Nutrient Input Study





# Next Steps



- 1. Identify Stakeholders & Interested Parties**
- 2. Identify Perceptions & Concerns of Stakeholders**
- 3. Attempt to Identify Sources of Problems Instead of Symptoms**
- 4. Identify Possible Solutions & Project Partners**
- 5. Identify Time Frames, Cost Approximations, & Possible Funding Opportunities (Low-Hanging Fruit versus Long-Term Projects)**

# **Then: Develop A Well-Defined Plan!**

- **1 UPRP Staff, 7 Conservation Commissioners, 3 (very long!) meetings.**
- **Defined Broad Goal(s) for each pond.**
- **Listed objectives and possible projects to meet that goal including:**
  - 1. Water Quality Improvement Projects**
  - 2. Outreach/Education Endeavors**
  - 3. Recreational Opportunities**
  - 4. Land Preservation Opportunities**



**The Result: A document that prioritizes projects according to category, feasibility, and cost analysis**

# Measurements

## 5 Years Later (2005)

- **UPRP Coordinator Position: Permanent Fixture in Planning Department.**
- **Crystal Lake: 6/10 identified projects implemented\***
- **Dorris Pond: 8/15 identified projects implemented\***
- **Maxwell Pond: 4/8 identified projects implemented\***
- **McQuesten Pond: 3/8 identified projects implemented\***
- **Nutts Pond: 8/9 identified projects implemented\***
- **Pine Island Pond: 3/8 identified projects implemented\***
- **Stevens Pond: 3/8 identified projects implemented\***



# The Fine Print\*

## Restoration/Project Implementation Obstacles:

- **Limited Time (5 Years)**
  - **Several Project Partners:** (*Conservation Commission, Environmental Protection Division, Highway Department, Parks & Recreation, Planning Department*)
  - **Engineering Design Phase**
  - **Permitting Phase**
  - **Contracting Phase**
  - **Remaining projects large, difficult, expensive**
  - **Some are in one of several phases, will be started or completed within year or two.**
- **Limited Budget (\$1 Million): More \$ Needed from City, Grants**
- **Low-Hanging Fruit (Small projects, outreach/education, etc)**

A stylized illustration of two men shaking hands. The man on the left is shown in profile, facing right, with dark hair and a beard. The man on the right is facing forward, wearing glasses, a white shirt, a dark tie, and a dark suit jacket. They are both smiling. The background is a large yellow circle with white polka dots. The text is overlaid on the left side of the circle.

## **4. Case Studies: Solutions & Project Implementation**

## **5. Outreach/Education Endeavors**

# Crystal Lake: “Stormtreat”

**6 sedimentation chambers & constructed wetland in a tank.**

- 1. Stormwater —————> chambers. Larger solids removed.**
- 2. Inside skimmers empty the upper portions of basins. More turbid waters left below.**
- 3. Partially treated stormwater —————> into surrounding constructed wetland through a series of slotted pipes.**
- 4. Wetland is of gravel substrate planted with bulrushes, etc.**
- 5. Stormwater —————> subsurface of wetland & through root zone.**

**Pollution is filtered, adsorbed, and bio-chemically reacts**



# **Crystal Lake & Pine Island Pond: City Sewer Interceptor/Tie In**

- ❖ **Crystal Lake – 2001**
- ❖ **Pine Island Pond – Fall 2003**
- ❖ **All homes/camps**
- ❖ **Decrease in bacteria levels & nutrient inputs.**



# Crystal Lake: Parking Lot Reconstruction & Drainage Improvement

**Purpose:** Improve the water quality through the installation of BMPs at two stormwater inlets. Combination of bank stabilization, grassed swales, infiltration areas, and velocity-reducing structures will capture nutrients and bacteria, before entering the lake.



**Grant Amount: \$73,483.00**  
**Local Match Amount: \$50,668.00**  
**Total Project Cost: \$124,151.00**



# Crystal Lake: Parking Lot Improvements

**Drainage Trench**



**Updated Parking Area**





# Crystal Lake: Parking Lot Improvements

**Leaching Catch Basin**



**Drainage Swale**





# Crystal Lake: Vandalism

**ATV/Bike Damage**



**Guard Rail**





# Crystal Lake: Corning Road Drainage Improvements

## Installation of Granite Curbing



## Bank Stabilization



## Baffle Tank: Area Paved, Loamed, Seeded





# Crystal Lake: *Phragmites* Control

**Area to be Dredged:**

**End of Parking Lot Drainage**



**Dredging**





# Crystal Lake: *Phragmites* Control

**Dewatering Area**



**Dredged Area**





# Crystal Lake: *Phragmites* Control





# **Dorrs Pond: “Downstream Defender”**

**Separates solids from liquids by using fluid hydraulics**

- 1. Placement of inlet/outlet pipes direct flow in a pre-determined path**
  - 2. Stormwater introduced into the side, spirals around the perimeter, & oil and floatables rise to the water surface and are trapped**
  - 3. Flow continues to rotate & travels down toward the bottom**
  - 4. Sediment directed toward the center/bottom of the vessel and is collected**
  - 5. Center protects sediment & redirects the main flow upwards/ inwards.**
- By the time the flow reaches the top of the vessel, it is virtually free of solids and is discharged through the outlet pipe.**

# **Dorrs Pond: Tributary Work**

**Purpose:** Address nutrient loading and sedimentation in Dorrs Pond. Inlet II East collects large amounts of untreated runoff and is leading to the eutrophication of the pond. Installation of primary and secondary treatment to greatly reduce the pollutant load reaching the pond. Treatment measures include a water quality inlet device and meandering grass swale.



**Grant Amount: \$48,321.00**

**Local Match Amount: \$32,213.40**

**Total Project Cost: \$80,534.40**



# Dorrs Pond: Tributary 1

**Existing Headwall**



**Baffle Tank**



**Completed Site**





# **Dorrs Pond: Tributary 1**

**Erosion Control**



**Soil Over Headwall**



**Soil Over Headwall**





# **Dorrs Pond: Tributary 1**

## **Curbing Installed**



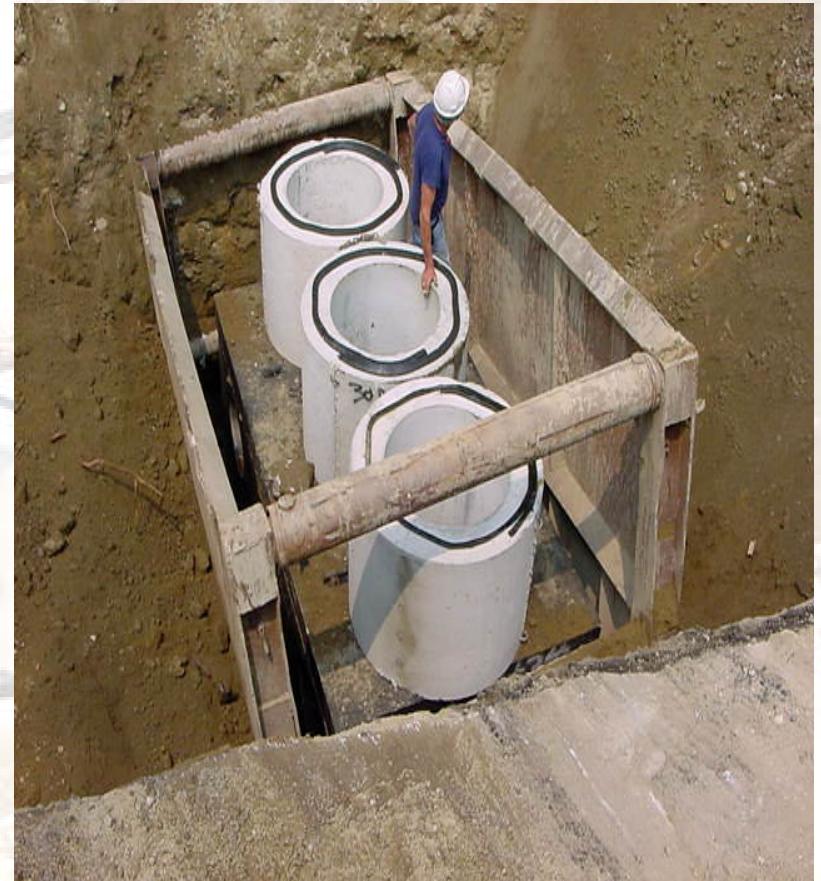


# **Dorrs Pond: Tributary 2**

**Trees Removed**



**Baffle Tank Installed**



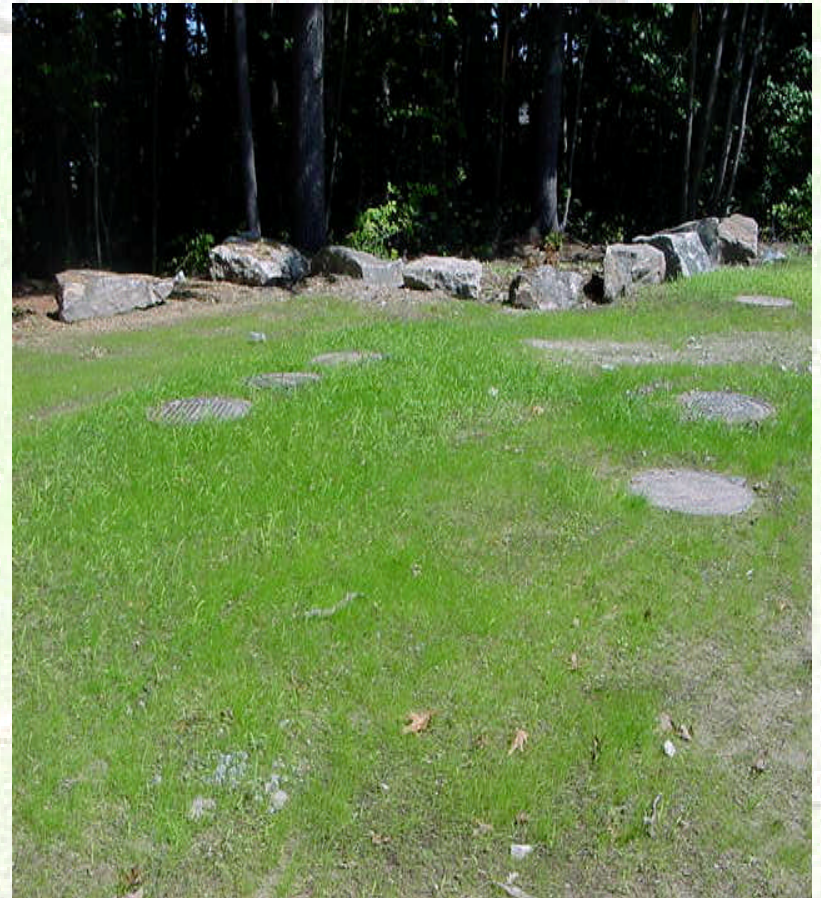


# Dorrs Pond: Tributary 2

**Granite & Arborvitae**



**Vegetated Site**





# Dorrs Pond: Tributary 3

## Brook Channeling



## Bio Logs



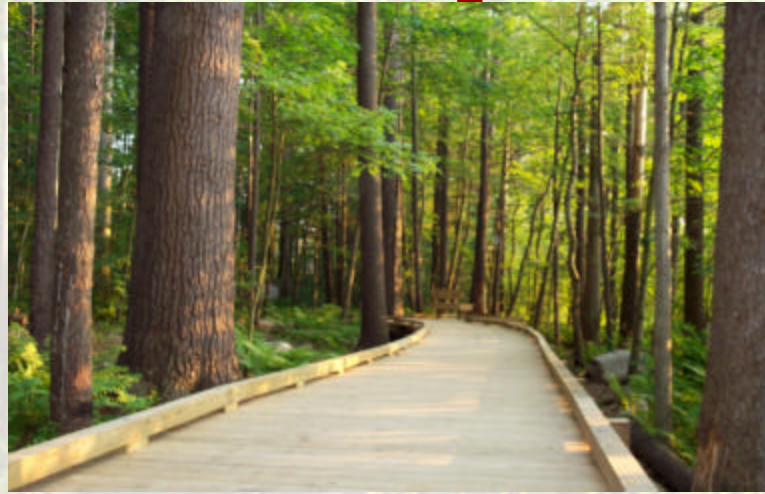


# Dorrs Pond: Shoreline Stabilization





# **Dorrs Pond: Rehabilitation of Walkways/Loop Trail, Parking Lot & Boat-Ramp**





# **Maxwell Pond/Black Brook: Dam Removal Feasibility Study & Corridor Restoration**



# Nutts Pond: Rails-To-Trails

- In partnership with Queen City Trail Alliance
- Will connect South Willow Street with Downtown/Millyard
- Runs adjacent to the west side of Nutts Pond





# **Nutts Pond: Pollution Prevention On-Site Assessment Business Survey**

- **Storage tanks**
- **Solid waste/dumpster maintenance**
- **Floor drains**
- **Stormwater management**
- **Hazardous waste storage**
- **Cleaning products**
- **Used oil**
- **Parts washing/absorbents**
- **Lead-acid batteries**
- **Antifreeze**
- **Vehicle washing, etc.**



**\*Businesses visited & surveys completed during the Summer of 2003\***

**\*Businesses which were visited received BMP materials in appropriate areas\***

**\*Follow up visits may be held to gain specific measurements\***

# **Stevens Pond: Chloride Reduction Feasibility Study**

**Chloride & sodium levels are among the highest ever recorded  
in a freshwater body in New Hampshire!**

**Task 1. Delineate Drainage Areas** –using topo & storm drain maps

**Task 2. Calculate Land Areas Receiving Salt Applications** -1)  
roadway maintained by DOT 2) roadway maintained by the City of Manchester 3)  
private roadways 4) residential properties 5) commercial properties.

**Task 3. Calculate Annual Salt Loadings to the Pond for Each  
Category and Each Subwatershed**

**Task 5. Prepare a Letter Report** –Summarizing findings & making  
recommendations.



## 5. Outreach/Education Endeavors



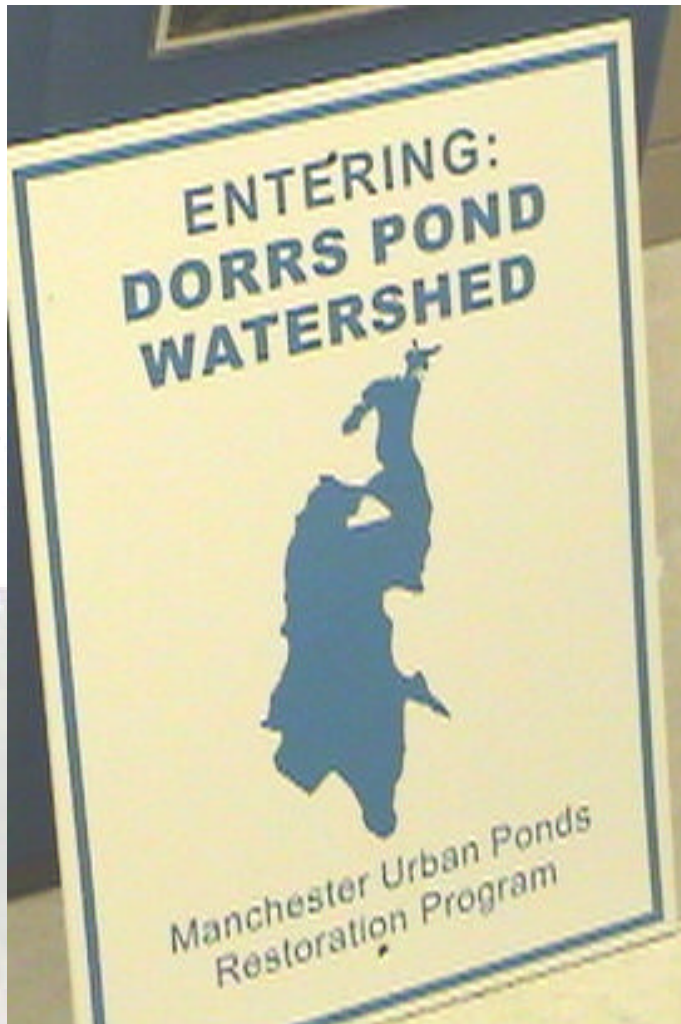
# Community Involvement

- ❖ **Bi-Annual Pond Clean-Ups**
- ❖ **Water Quality Monitoring Assistance**
- ❖ **Local Pond Preservation Societies**
- ❖ **Storm Drain Stenciling Events**
- ❖ **Shoreline Surveys**





# Watershed Signs



# Presentations & Events

❖ **Classroom Presentations (Middle School, High School, Community Colleges)**

❖ **Other Presentations: NHDES, NHLA**

## Meet Your Pond!



Do you see Manchester's urban ponds as life-less or "dead"? The truth is, they are abundant with life!

Join the Urban Ponds Restoration Coordinator and members of the conservation commission for a "Meet Your Pond" adventure!

We will walk the trails, identify native and exotic vegetation (including a carnivorous plant!), collect and identify common stream insects, look for frogs, fish, birds, and even examine tiny, microscopic plants (phytoplankton) and animals (zooplankton). We will also discuss current issues surrounding the pond, and what we can do to improve the water quality.



In addition, you can see how to sample a pond for chemical and biological parameters. Boat rides may be available. If you have them, bring your boots, binoculars, and dress accordingly!

### Join Us!

All pond activities are from 9:00-12:00noon.

Saturday July 13: Doors Pond

Thursday July 18: Nutts Pond

Saturday August 3: Maxwell Pond

Saturday August 10: Stevens Pond

Thursday August 15: McQuesten Pond



## SECOND ANNUAL MANCHESTER EARTH AND PONDS FESTIVAL

Date: Saturday 6/22/02 Time: 10 AM - 3 PM  
Livingston Park, D.W. Highway, Manchester

Join us for an outdoor family festival designed to raise awareness of Manchester's environment!

### Highlights Include:

- Environmental exhibitors
- Kids activities
  - face painting
  - games, clowns
- Raffle prizes
- Kayak demonstrations
- Interpretive trail walks
- Live entertainment



This Event Is Sponsored By:  
Manchester Urban Ponds Restoration Program  
Manchester Recycling Committee  
Manchester Conservation Commission





The display board for the Manchester Urban Ponds Restoration Program is a comprehensive resource for the community. It features several key sections:

- Restoration Program:** A large panel at the top center detailing the program's goals and objectives.
- What Is The Manchester Urban Ponds Restoration Program?:** A panel explaining the program's purpose and the issues it addresses.
- What Are The Goals of the Manchester Urban Ponds Restoration Program?:** A panel listing the program's goals, such as improving water quality, creating wildlife habitat, and providing recreational opportunities.
- What Are Some Of The Issues Facing These Ponds?:** A panel discussing the challenges faced by urban ponds, including pollution, siltation, and lack of maintenance.
- What Project Participants & What Do They Do?:** A panel identifying the various groups and individuals involved in the program, such as the City of Manchester, the U.S. Environmental Protection Agency, and local volunteers.
- Manchester Urban Ponds Conservation Parks:** A panel highlighting the program's efforts to create and maintain urban ponds as conservation parks.
- Manchester Urban Ponds:** A panel providing information about the various ponds in the city and the restoration work being done at each.
- Manchester Urban Ponds Restoration Program:** A panel providing contact information and resources for the program.

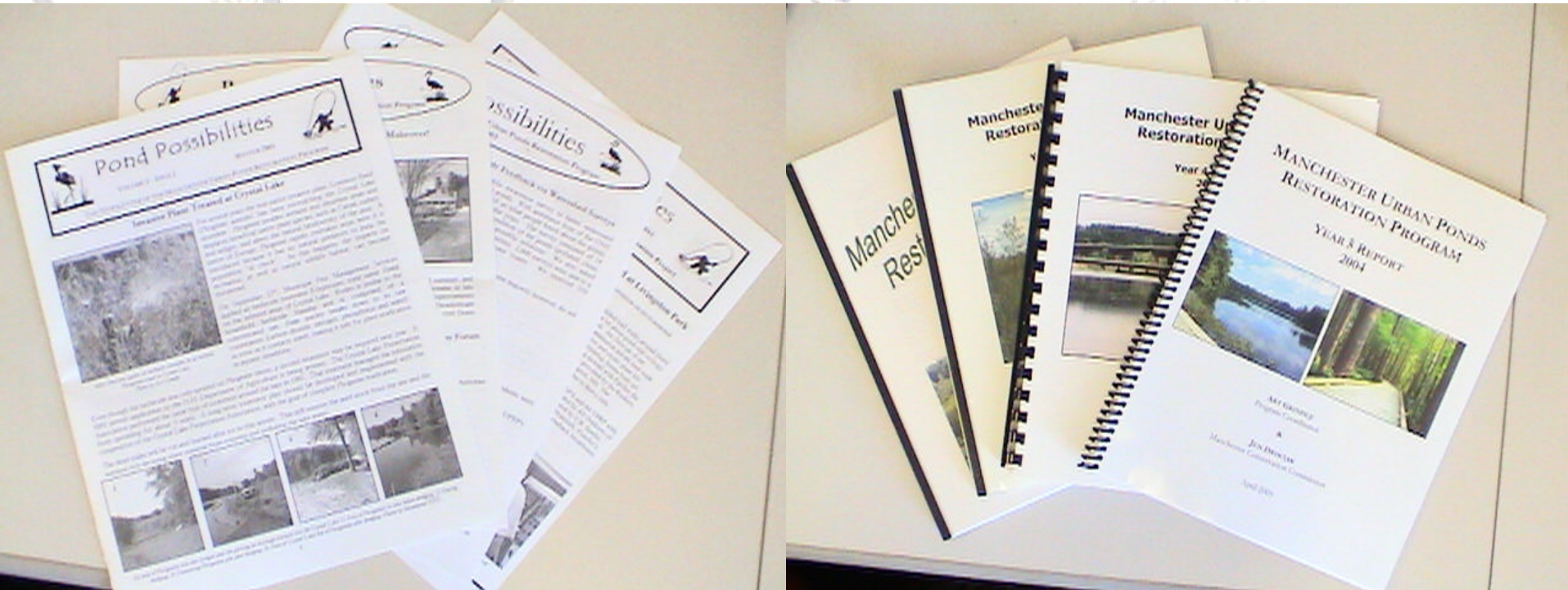
The board is decorated with numerous photographs of urban ponds, some showing the current state of the ponds and others showing the progress of restoration work. It also includes several brochures and pamphlets, including a "Support Local Conservation" sign and a "Manchester's Environmental Challenge" brochure. The display is set on a red and white checkered floor, and a small blue sign with a white fish icon is placed near the bottom left corner.

**City Hall, Workshops, Conferences, Festivals, Libraries, Schools**



# Newsletters & Annual Report

**600 Copies of “Pond Possibilities”  
Produced and Distributed Bi-Annually**



**60 Copies of Report  
Produced and Distributed Annually**



# Creation & Retrofit of Kiosks



- **Constructed 3 Kiosks (Maxwell Pond, McQuesten Pond, Stevens Pond)**
- **Retrofitted 3 Kiosks (Crystal Lake, Nutts Pond, Pine Island Pond)**

# Fact-Sheets (For Kiosks & Events)

- ❖ Map of waterbody/watershed.
- ❖ Pond Facts.
- ❖ Water Quality Data.
- ❖ History of Waterbody.
- ❖ Common Exotic Plants.
- ❖ Common Fish.
- ❖ Nonpoint Source Pollution Issues.

**Manchester Urban Ponds Restoration Program**  
One City Hall Plaza, Manchester, NH 03101 | (603) 424-4400  
[www.manchester-nh.gov/UrbanPonds](http://www.manchester-nh.gov/UrbanPonds)

### Crystal Lake Facts

- Agency: City of Manchester, Department of Public Works
- Official Name: Crystal Lake, formerly known as Crystal Pond
- Typical Waterbody: Natural pond
- Watershed Area: 240.0 acres (97.5 hectares)
- Watershed Street: 1000 ft (305 m)
- Volume of Water: 100,000 cu ft
- Mean/Average Water Depth: 3.3 feet (1.0 m)
- Maximum Water Depth: 11 feet (3.4 m)
- Shoreline Length: 1000 feet (305 m)
- Elevation: 240 feet
- Flowing Run: 1000 feet
- Current Ownership: City of Manchester
- Associated Public Services: Health and Safety
- Land Legend: "The History of Manchester" (Crystal Lake)
- Other City Hall: "The History of Manchester" (Crystal Lake)

Photo: Manchester Urban Ponds Restoration Program

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### The History of Crystal Lake

Crystal Lake is one of Manchester's most beautiful water bodies. It is a natural pond, formerly known as Crystal Pond. The lake is located in the heart of the city, and it is a popular spot for recreation. The lake is surrounded by a park, and it is a great place to enjoy the outdoors. The lake is a natural pond, and it is a great place to enjoy the outdoors. The lake is a natural pond, and it is a great place to enjoy the outdoors.

**The Pond and Photo**

Photo: Manchester Urban Ponds Restoration Program

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### Have You Seen These? Exotic Plants of Crystal Lake

Exotic plants are those that are not native to the area. They can be harmful to the environment and can cause damage to the ecosystem. It is important to identify and remove these plants to protect the natural environment.

**Exotic Plants of Crystal Lake**

- **Water Hyacinth**: A floating aquatic plant that can form dense mats on the water surface.
- **Water Lettuce**: A floating aquatic plant that can form dense mats on the water surface.
- **Water Mimosa**: A floating aquatic plant that can form dense mats on the water surface.
- **Water Chestnut**: A floating aquatic plant that can form dense mats on the water surface.
- **Water Fern**: A floating aquatic plant that can form dense mats on the water surface.
- **Water Lily**: A floating aquatic plant that can form dense mats on the water surface.
- **Water Hyacinth**: A floating aquatic plant that can form dense mats on the water surface.
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- **Water Fern**: A floating aquatic plant that can form dense mats on the water surface.
- **Water Lily**: A floating aquatic plant that can form dense mats on the water surface.

Photo: Manchester Urban Ponds Restoration Program

**Manchester Urban Ponds Restoration Program**  
One City Hall Plaza, Manchester, NH 03101 | (603) 424-4400  
[www.manchester-nh.gov/UrbanPonds](http://www.manchester-nh.gov/UrbanPonds)

### Common Fish Species of Crystal Lake

Crystal Lake is home to a variety of fish species. The most common species are listed below. These fish are important to the ecosystem and can be found in the lake.

**Common Fish Species of Crystal Lake**

Species	Length	Weight	Age
Brook Trout	12-18 inches	1-2 pounds	1-2 years
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Brook Trout	12-18 inches	1-2 pounds	1-2 years
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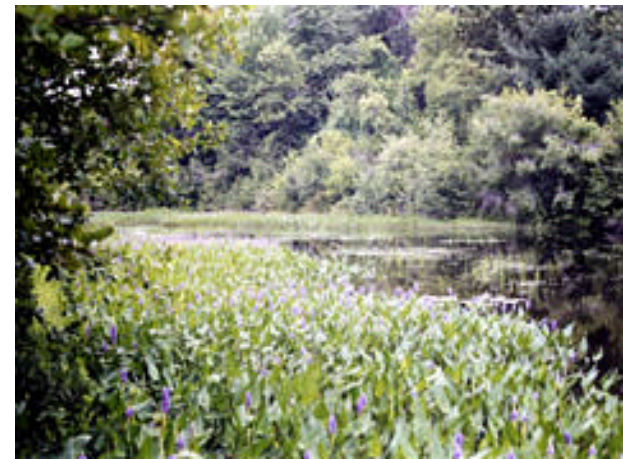
Photo: Manchester Urban Ponds Restoration Program





**Web Site!**

**[www.manchesternh.gov/UrbanPonds](http://www.manchesternh.gov/UrbanPonds)**





**Thank You!**

**Jen Drociak –  
Manchester Conservation Commission  
Urban Ponds Restoration Program**

**1 City Hall Plaza  
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